

WHAT IS CLAIMED IS:

1. A liquid crystal display device comprising:

a first substrate;

a second substrate;

5 a liquid crystal layer disposed between the first substrate and the second substrate; and

*claim 16
modify
from*
10 a plurality of picture element regions each defined by a first electrode provided on a face of the first substrate facing the liquid crystal layer and a second electrode provided on the second substrate so as to oppose the first electrode via the liquid crystal layer sandwiched therebetween,

15 wherein the first electrode includes a plurality of openings and a solid portion in each of the plurality of picture element regions,

the liquid crystal layer is in a vertical orientation state in each of the plurality of picture element regions when no voltage is applied between the first electrode and the second electrode, and

20 when a voltage is applied between the first electrode and the second electrode, a plurality of liquid crystal domains each in a radially-inclined orientation state are formed in the plurality of openings and the solid portion by inclined electric fields generated at respective edge
25 portions of the plurality of openings of the first electrode,

for producing a display by changing orientation states of the plurality of liquid crystal domains in accordance with the applied voltage.

2. The liquid crystal display device of Claim 1,

5 wherein at least some of the plurality of openings have substantially the same shape and the same size, and form at least one unit lattice arranged so as to have rotational symmetry.

3. The liquid crystal display device of Claim 2,

10 wherein each of the at least some of the plurality of openings is in a rotationally symmetrical shape.

4. The liquid crystal display device of Claim 2,

wherein each the of at least some of the plurality of openings is in a substantially circular shape.

15 5. The liquid crystal display device of Claim 2,

wherein each region of the solid portion surrounded with the at least some of the plurality of openings is in a substantially circular shape.

6. The liquid crystal display device of Claim 2,

20 wherein each region of the solid portion surrounded with the at least some of the plurality of openings is in a substantially rectangular shape with substantially arc-shaped corners.

7. The liquid crystal display device of Claim 1,

25 wherein, in each of the plurality of picture element

regions, a total area of the plurality of openings of the first electrode is smaller than an area of the solid portion of the first electrode.

8. The liquid crystal display device of Claim 1,
5 further comprising a protrusion within each of the plurality of openings,

wherein a cross-sectional shape of the protrusion taken along a plane direction of the substrate is the same as a shape of the corresponding opening, and

10 a side face of the protrusion has an orientation-regulating force for orienting liquid crystal molecules of the liquid crystal layer in the same direction as an orientation-regulating direction obtained by the inclined electric field.

15 9. The liquid crystal display device of Claim 1,
wherein the plurality of liquid crystal domains are in a spirally radially-inclined orientation state.

20 10. The liquid crystal display device of Claim 9,
further comprising a pair of polarizing plates respectively provided outside of the first substrate and the second substrate and disposed with polarizing axes thereof crossing each other substantially perpendicularly,

wherein, in each of the plurality of liquid crystal domains, assuming that a liquid crystal molecule included in
25 the liquid crystal layer and positioned in a 12 o'clock

direction on a display surface in regard to a center of each of said plurality of liquid crystal domains is inclined against the 12 o'clock direction on the display surface by an angle θ , the polarization axis of one of the pair of polarizing plates is inclined in the same direction as inclination of the liquid crystal molecule positioned in the 12 o'clock direction on the display surface by an angle exceeding 0 degree and smaller than 2θ against the 12 o'clock direction on the display surface.

11. The liquid crystal display device of Claim 10, wherein the polarization axis of one of the pair of polarizing plates is inclined by an angle exceeding 0 degree and equal to θ or less.

12. The liquid crystal display device of Claim 10, wherein the polarization axis of one of the pair of polarizing plates is inclined by an angle substantially the same as $\theta/2$.

13. The liquid crystal display device of Claim 10, wherein the polarization axis of one of the pair of polarizing plates is inclined by an angle substantially the same as θ .

14. The liquid crystal display device of Claim 1, wherein the solid portion includes a plurality of island portions arranged in the form of an $m \times n$ matrix and a plurality of branch portions for electrically connecting

adjacent pairs of the plurality of island portions, and

the number of the plurality of branch portions is smaller than $(2mn - m - n)$.

15. The liquid crystal display device of Claim 1,

5 wherein the first substrate further includes an active element provided correspondingly to each of the plurality of picture element regions, and

10 the first electrode corresponds to a picture element electrode provided in each of the plurality of picture element regions to be switched by the active element and the second electrode corresponds to at least one counter electrode opposing the plurality of picture element electrodes.

16. A liquid crystal display device comprising:

15 a first substrate;

a second substrate;

a liquid crystal layer disposed between the first substrate and the second substrate; and

20 a plurality of picture element regions each defined by a first electrode provided on a face of the first substrate facing the liquid crystal layer and a second electrode provided on the second substrate so as to oppose the first electrode via the liquid crystal layer sandwiched therebetween,

25 wherein, in each of the plurality of picture element

regions, the liquid crystal layer is in a vertical orientation state when no voltage is applied between the first electrode and the second electrode, and the first electrode includes a plurality of openings disposed at least
5 corners of each of the plurality of picture element regions
and a solid portion.

17. The liquid crystal display device of Claim 16,
wherein a region of the solid portion surrounded with
at least some of the plurality of openings is in a
10 rotationally symmetrical shape.

18. The liquid crystal display device of Claim 16,
wherein a region of the solid portion surrounded with
at least some of the plurality of openings is in a
substantially circular shape.

19. The liquid crystal display device of Claim 16,
wherein a region of the solid portion surrounded with
at least some of the plurality of openings is in a
substantially rectangular shape with substantially arc-shaped
corners.

20. The liquid crystal display device of Claim 16,
wherein the solid portion includes a plurality of
island portions arranged in the form of an $m \times n$ matrix and a
plurality of branch portions for electrically connecting
adjacent pairs of the plurality of island portions, and

the number of the plurality of branch portions is

smaller than $(2mn - m - n)$.

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